understand the underlying thought. The theory of relativity belongs to theoretical physics in the widest sense and this is mathematical description of the physical processes of nature." In the course of the book the only assumed knowledge of mathematics and physics is such as is given in the first semesters at a university.

Fundamentals of High School Mathematics. A Textbook designed to follow Arithmetic. By H. O. Rugg and J. R. Clark. Yonkers-on-Hudson, World Book Co., 1920. 15 + 368 pp. 12mo. Price $1.80. [Answer book, 16 cents.]

Attention is drawn to this work for first year high school mathematics, by teachers in the Lincoln School, New York. It is a development from their study, *Scientific Method in the Reconstruction of Ninth-Grade Mathematics* (University of Chicago Press, 1918, 8vo. 189 pages), and takes account of principles formulated by the National Committee on Mathematical Requirements. A rough draft "experimental edition" (8 + 266 pages) was published in 1918 and distributed at cost for experimental purposes only.

The Slide Rule: A Practical Manual. By C. N. Pickworth. Seventeenth edition. Manchester, Emmot & Co.; London, Emmot & Co., and Pitman & Sons, 1921. 12mo. 133 pp. Price 3 shillings and 6 pence (the New York agent, I. Pitman & Sons, charges more than double this price, namely, $1.50).

This book has been well known for twenty years, the eleventh edition appearing in 1908, the fourteenth in 1916, and the fifteenth in 1917, each of these editions containing revisions and new matter. The present edition contains eight pages more than the fourteenth, the additions including descriptions of new slide rules, and a section dealing with screw-cutting gear calculations by the slide rule.

NOTES.

In *Bulletin des Sciences Mathématiques,* July–August, 1921, there is a historical article by C. de Waard entitled "Une lettre inédite de Roberval du 6 Janvier, 1637, contenant le premier énoncé de la cycloïde."

In *Proceedings of the Benares Mathematical Society,* volume 2, part 2, 1920, is published "On mathematical research in the last 20 years," the presidential address delivered on January 31, 1921, by Dr. Ganesh Prasad, professor of mathematics in the Benares Hindu University. Compare *1921,* 31, 179, 191.

Revista Matemática Hispano-Americana, June, 1921, contains, pages 161–166, a portrait, brief biographical sketch, and bibliography of the writings (59 titles), of C. J. de la Vallée-Poussin.

The eleventh paper in *Proceedings of the Royal Society of Edinburgh,* volume 41, 1920–1921, is (pages 111–116) "Note on a continuant of Cayley's of the year 1874" by Sir Thomas Muir, the African member of our Association.

There are 81 names in the list of members of the "Gazeta Matematică" Society of Roumania, published in the first number, September, 1921, of *Gazeta Matematică,* volume 27.

The summer number of *Isis,* 1921, includes the following articles: "Two twelfth century algorisms" by L. C. Karpinski, 396–413; "History of symbols for *n*-factorial" by F. Cajori, 414–418.

The fourth and last volume of E. Beltrami, *Opere matematiche pubblicate per cura della Facoltà di Scienze della R. Università di Roma,* was issued from the press of Hoepli, Milan, in 1920 (554 pages; price 50 lire).

In *L'Intermédiaire des Mathématiciens*, July–August, 1920, there is an article, "Charles Ange Laisant (1841–1920)" by the editors—H. Brocard gives additional biographical and bibliographical material concerning Laisant (compare *1921*, 319) in *Sphinx-Œdipe*, August–December, 1921.

In *Sitzungsberichte der Heidelberger Akademie der Wissenschaften, Mathematisch-naturwissenschaftliche Klasse, Abteilung A. Mathematisch-physikalische Wissenschaften*, 1920, about half the numbers deal with topics of mathematical interest. Number 7, by Oskar Perron, is entitled: "Paul Stäckel†," and number 14, by Karl Bopp: "Moritz Cantor†. Gedächtnisrede, gehalten im Mathematischen Verein zu Heidelberg am 19. Juni 1920."

We are glad to note that the editors of *Journal of the Mathematical Association of Japan for Secondary Education* have found in our MONTHLY yet other articles (cf. *1921*, 79) of interest to their constituency. In the issue for April, 1921 (pages 47–50), there is a Japanese translation of Professor A. S. MERRILL's article, "The 'danger area' curve" (*1920*, 398–410). In the issue for July (pages 94–98) there is practically a complete transcript, in rearranged form, of a list, prepared by the Library Committee of our Association, of 160 mathematical books for schools and colleges (*1917*, 369–376).

The concluding number of *Bulletin of the Calcutta Mathematical Society*, volume 11 (262 pages), was published in March, 1921. This periodical, devoted to higher mathematics, pure and applied, is excellently printed and edited. At the close of 1920 the Calcutta Mathematical Society had 170 ordinary members and 25 honorary members. During 1920, 32 papers were read, and the published accounts show a surplus—a state of affairs which most mathematical societies must envy.

L'Astronomie et les Astronomes by AUGUSTE COLLARD (Bruxelles, G. Van Oest et Cie., 1921. 8 + 119 pages) is a useful bibliography with the following headings: (*a*) Dictionaries and encyclopaedias of astronomy; (*b*) Biographies of astronomers; (*c*) Treatises on astronomy, subdivided into many sections; (*d*) Histories; (*e*) Bibliographies; (*f*) Atlases; (*g*) Reviews; and (*h*) Tables. Brief notes summarizing the scope of the work are added to the titles in many cases. It is intended as a supplement to the work of Houzeau and Lancaster, 1882–1889.

The last number (published, May, 1921) of *Proceedings of the London Mathematical Society*, volume 19, contains the following obituary notices: "Hieronymus Georg Zeuthen" (1839–1920) by H. W. R[ichardson], xxxvi–xxxix; "Srinivasa Ramanujan" (1887–1920) by G. H. H[ardy], xl–lviii; "Philip Edward Bertrand Jourdain" (1879–1919) by D. M. W[rinch], lix–lx. We are especially tempted to quote from the very interesting memoir by Professor Hardy, but we must confine ourselves to references to quotations already made in this connection: *1920*, 316, 338; *1921*, 219, 224.

Proceedings of the American Academy of Arts and Sciences, volume 56, no. 10, July, 1921, is devoted to The Rumford Fund for researches in light and heat, and contains a list of the various awards and grants (to 102 individuals) from

the first in 1839 to the two hundred and thirty-first in December, 1920. This list includes: a grant in 1883 of $30 to F. N. COLE towards "experiments on Maxwell's theory of light"; a grant in 1913 of $200 to H. N. DAVIS for thermo-dynamical researches; 3 grants, 1877–1895, of $200–$250 each to B. O. PEIRCE; and 7 grants, 1901–1920, of $65–$500 each to A. G. WEBSTER.

The second and concluding number of the second volume (104 pages) of *Bulletin de la Société Mathématique de Grèce* (compare *1920*, 314; *1921*, 134) contains an article by E. T. BELL, of the University of Washington, entitled "Sur la forme $x^2 + 3y^2$ et l'équation modulaire pour la transformation du troisième ordre des fonctions elliptiques," 70–74. There is also (pages 100–101) a sketch of NIKOLAOS KARATSANIDES, professor of descriptive geometry and surveying at the Polytechneion (Greek Institute of Technology), Athens, who died February 18, 1920. He was born in 1852, taught in Bulgaria five years, and came in 1885 to Athens where as student, assistant, and teacher he remained for the rest of his life. He was the author of articles and of a small book in descriptive geometry for the lycea (high schools).

The seventeenth volume (1884–1900, Marc–P) of the *Royal Society Catalogue of Scientific Papers* has been recently published (Cambridge University Press, £ 9, cloth binding; £ 10 s. 10, half morocco). The sixteenth volume (I–Marbut) appeared in 1918. One more volume will probably complete the work and the listing of over 300,000 papers published during the seventeen years 1884–1900. This invaluable author-index, covering the nineteenth century in eight alphabets, is too well known to need extended comment. Four volumes of a subject-index for the same period have also appeared. These are the volumes devoted to Mathematics, Mechanics, and Physics (2). It is sometimes useful to recall that the *Royal Society Catalogue* covers more than the nineteenth century in the case of some publications, for example: *Transactions of the American Philosophical Society*, 1771–1799; *Journal des Mines*, 1794–1799; *Memorie di Matematica e Fisica della Società Italiana delle Scienze*, Modena and Verona, 1782–1799; *Bulletin des Sciences de la Société Philomathique de Paris*, 1792–1799; and *Mémoires de l'Académie Royale des Sciences de Turin*, 1784–1799.

In *Archivio di Storia della Scienza* (*1921*, 134), volume 2, no. 1, published in January, 1921, there is a supplement, page 119, to A. Mieli's bibliography of Leonardo da Vinci (*1920*, 217) and a brief notice, page 97, of F. Cajori's *A History of the Conceptions of Limits and Fluxions in Great Britain from Newton to Wood-house*. In nos. 2–3, June, the contents include the following: "Sur l'auteur d'un traité 'De Motu' auquel Bradwardin a fait allusion en 1328" by G. Enes-tröm, 133–136; "Philip E. B. Jourdain, matematico e storico della scienza (1879–1919)," 167–184 [there are 107 titles in the list of his publications]; "La storia della matematica presso i Cechi" by Q. Vetter, 199–201; "Gli studi geometrici di Eudosso da Cnido" by E. Ruffini, 222–239. Eudoxus (about 408–355 B.C.) was the first to discover the 'method of exhaustions' and to give a scientific proof that the cone and the pyramid are one third of the cylinder

and prism respectively which have the same base and height.   He was also the originator of the theory of proportion, covering incommensurables, as expounded in books 5 and 6 of Euclid's 'Elements'; the first five propositions of book 13, involving golden section, are probably due to him.   The curve hippopede (horse-fetter), or kampyle, or spherical lemniscate, invented by him, played a fundamental rôle in the ancient system of astronomy of which he was the author.   Full discussion in this connection may be found in T. L. Heath, *Aristarchus of Samos*, Oxford, 1913, pages 190–212.

Attention is directed to an important new work, *Physics, The Elements* by N. R. CAMPBELL (Cambridge University Press, 1920. Royal 8vo. 9 + 565 pages.   Price 40 shillings).   The first part (264 pages) deals with "The propositions of science" and there are chapters on 'Chance and probability' (pages 159–214), 'The meaning of science' (pages 215–219) and 'Science and philosophy' (pages 230–265).   The second part (283 pages) discusses "Measurement," with the chapter titles: Fundamental measurement; Physical number; Fractional and negative magnitudes; Numerical laws and derived magnitudes; Units and dimensions; The uses of dimensions; Errors of measurement, methodical errors; Errors of measurement, errors of consistency and the adjustment of observations; Mathematical physics.—Another work *Physik und Hypothese. Versuch einer induktiven Wissenschaftslehre nebst einer kritischen Analyse der Fundamente der Relativitätstheorie* by HUGO DINGLER (Berlin and Leipzig, Vereinigung wissenschaftlicher Verleger, 1921, 8vo. 11 + 200 pages. Price, paper covers, $1.50) is a supplementary volume to the author's *Grundlagen der Physik* (same publisher, 1919. 12 + 158 pages.   Price, paper covers, 16.50 marks).   The treatment is philosophic, and very little mathematical symbolism occurs in the book.   "But my researches have an important relation to mathematics.   Only by the path here taken can we arrive at the explanation of the nature of the axioms, their proper grounding, etc." (preface).   It will be recalled that Dr. Dingler is the author of *Das Prinzip der logischen Unabhängigkeit in der Mathematik* (München, Theodor Ackerman, 1915. 6 + 164 pages); in the work under review he promises a volume on the philosophy of mathematics.

Flatland.   A Romance of Many Dimensions. By the Author A. Square. With illustrations by the Author.   "Fie, fie, how frantically I square my talk." London, Seeley & Co., 1884.   Such was the title page of a crown quarto booklet, issued anonymously in parchment wrappers (100 pages), which in one form or another has delighted and informed more than a generation of readers—mathematical and otherwise.   In 1885 a much less attractive edition, of duodecimo format, was published by Roberts Brothers, Boston (155 pages); it was reprinted in 1891.   In 1896 the work was taken over by Little, Brown & Company, Boston, and their first edition appeared in 1899; there were other editions in 1907, 1911, 1915 and 1919.   About 2,700 copies have been printed in America and the book is still procurable.   In 1908 a Dutch translation, by L. van Zanten Jzn., was published at Zalt-Bommel (138 pages); the second Dutch edition appeared at

Zalt-Bommel in 1915, and the third at Amsterdam in 1920: *Platland. Eene roman van vele afmetingen.* Met Illustraties. Door Een Vierkant. Uit het Engelsch. Vierde Druk. The format and type are similar to that of the English edition,[1] which has been long out of print.

In none of these eleven editions or reprints is there any hint as to the author of the work, namely, EDWIN ABBOTT ABBOTT,[2] English schoolmaster and theologian who graduated at St. John's College, Cambridge, where he took the highest honors in the classical, mathematical, and theological triposes. It was probably for this reason that he never heard of the Dutch translation of his book until it was brought to his attention in our correspondence last March.

Dr. Abbott is now in his eighty-third year. After holding masterships in several schools he retired in 1889 to devote himself to literary and theological pursuits. He has been a prolific writer. His *Shakespeare Grammar*, 1869, a "permanent contribution to English philology," and *How to Write Clearly*, 1872, have gone through many editions. He published a dozen other books, including two anonymous religious romances, before his single mathematical publication, where "the assumption of the author is worked with wonderful consistency, and his mathematics are thoroughly sound." His numerous other books, several of which were published anonymously, down to 1917, have dealt almost wholly with religious and theological topics. Other information regarding Dr. Abbott's work may be found in *Who's Who* and in the last edition of the *Encyclopædia Britannica*. (See *1919*, 264.)

ARTICLES IN CURRENT PERIODICALS.

AMERICAN JOURNAL OF MATHEMATICS, volume 43, July, 1921: "Integral products and probability" by P. J. Daniell, 143–162; "Introduction to a general theory of elementary propositions" by E. L. Post, 163–185; "Note on Schälfli's elliptic modular functions" by A. Berry, 186–188; "Associated forms in the general theory of modular covariants" by Olive C. Hazlett, 189–198; "On (2, 3) compound involutions" by T. R. Hollcroft, 199–212.

ANNALS OF MATHEMATICS, volume 22, no. 4, June (published in September), 1921: "An analytical solution of Biot's problem" by T. Hayashi, 213–216; "Minimal surfaces containing straight lines" by J. K. Whittemore, 217–225; "An extension of Green's lemma to the case of a rectifiable boundary" by E. B. Van Vleck, 226–237; "Periodic conjugate nets" by E. S. Hammond, 238–261; "On the transformation of convex point sets" by J. L. Walsh, 262–266.

JOURNAL OF THE INDIAN MATHEMATICAL SOCIETY, volume 13, February, April, 1921: "An algebra of arithmetic functions" (concluded) by F. Hallberg, 1–8; "The group theory element of the history of mathematics" by G. A. Miller, 9–12, 57–61 [Reprinted from *Scientific Monthly*, January, 1921; see *1921*, 226]; Leaves from a lecturer's diary, 13–14; Questions and Solutions, 15–40, 62–80; "Some applications of Heawood's theorem" by N. D. Rajan, 41–44; "The theory of rational transformation" by R. Vythyanathaswami, 45–56.

MATHEMATICAL GAZETTE, volume 8, July, 1921: "Greek mathematics and science" by T. L. Heath, 289–301 [Paper read March 5, 1921, at a joint meeting of the Yorkshire Natural Science Association and branches of the Classical Association and the Mathematical Association]; "Selection in arithmetical examples" by R. S. Williamson, 302–305; Note on "The sound ranging problem" by W. Hope-Jones, 306–307; Review by G. Greenhill of H. Lamb's *Higher Mechanics* (Cambridge, 1920), 309–319; Review of R. C. Archibald's *Training of Teachers of Mathematics for Secondary Schools* (Washington, 1918), 320.

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[1] There was a second English edition containing a few extra pages, but the date of this could not be determined.

[2] There is here a play on the author's name Abbott Abbott, initials A. A. = A², in "By the Author A Square."